MISHIMOTO

ENGINEERING REPORT

Intercooler & Intercooler Piping fits 2022+ Honda Civic Si | SKU: MMINT-CIV-22K

By: Anthony Feola, Mishimoto Product Engineer

REPORT AT A GLANCE

- **Goal:** Create a direct-fit performance intercooler and piping kit that outperforms the stock intercooler and stock piping.
- **Results:** The Mishimoto intercooler increased airflow through the intercooler by 32.4% and reduced the average pressure drop by 20.7% compared to the stock intercooler. The average outlet temperature of the Mishimoto intercooler was 18.1°F (7.7°C) less than that of the stock intercooler. The Mishimoto intercooler resulted in maximum gains of 7.2 HP in power and 8.6 lb-ft of torque. The peak gains were 6.7 HP in power and 2.5 lb-ft of torque.

  Adding the Mishimoto intercooler piping reduces the total average pressure drop by 25.7% compared to the stock intercooler and piping.
- **Conclusion:** The Mishimoto intercooler and intercooler piping are great upgrades for anyone looking to get the most performance out of their Honda Civic Si.

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DESIGN OBJECTIVES

• Create an intercooler that performs better than the stock intercooler.

• The Mishimoto intercooler must not show a significant pressure loss compared to the stock intercooler.

• Create a piping kit that flows better than the stock piping.

DESIGN AND FITMENT

We began the R&D process by evaluating the stock Honda Civic Si intercooler to find potential room for improvement. The stock intercooler core is a 26.18" wide x 4.39" high x 2.52" thick, 7-row tube-and-fin design. The Mishimoto intercooler was designed as a much larger, 25.98" wide x 6.04" high x 4.53" thick, 9-row bar-and-plate intercooler to increase the amount of cooling surface area and core volume. This design makes the Mishimoto intercooler 146% larger than the stock Civic Si intercooler. The bar-and-plate design also features fully welded end tanks and a brazed core. This construction is much stronger than the plastic end tanks crimped to the core that the stock intercooler uses. This gives the Mishimoto intercooler much less chance of developing a leak and will allow it to handle much higher boost pressures. Figures 1 and 2 below compare the overall core volumes and fin surface areas of the stock and Mishimoto intercoolers. Figure 3 shows a physical comparison of the stock intercooler and the Mishimoto intercooler.

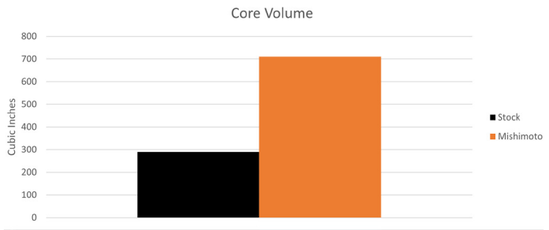

Figure 1: *The Mishimoto intercooler has a 146% increase in overall core volume compared to the stock intercooler.*

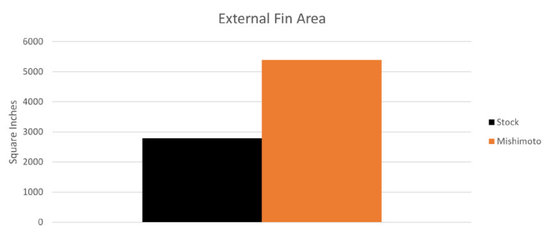

Figure 2: *The Mishimoto intercooler has a 94% increase in fin surface area over the stock intercooler.*

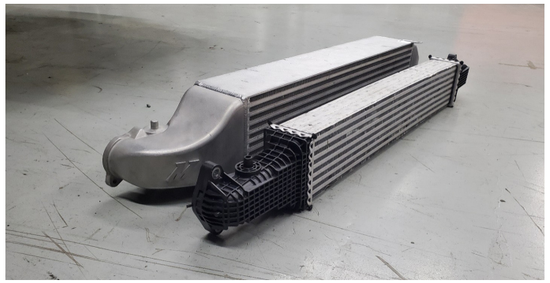

Figure 3: *Comparison of the stock intercooler to the Mishimoto intercooler.*

Due to the increase in size of the Mishimoto intercooler, the stock intercooler ducting would need to be replaced. Custom Mishimoto ducting was designed to replace the stock ducting, ensuring the Mishimoto intercooler continues to receive the best possible airflow. Figure 4 below shows a SolidWorks model of how the Mishimoto ducting interacts with the intercooler when installed on the vehicle. Figure 5 shows the Mishimoto ducting installed on the bumper.

Figure 4: *Mishimoto intercooler with Mishimoto intercooler ducting.*

Figure 5: *Mishimoto intercooler ducting installed on the Civic Si bumper.*

APPARATUS

For hardware, Mishimoto chose to use the AEM AQ-1 driven by the AQ-1 Data Acquisition System.

Figure 6: *AEM AQ-1 Data Logging System.*

Air temperatures and pressures were taken with Rife air temperature & pressure sensors from the inlet and outlet of the stock & the Mishimoto intercooler. A baseline of the temperature and pressure was recorded before the Mishimoto intercooler was installed. This allowed us to assess the intercooler's performance.

PERFORMANCE TESTING

First, the stock intercooler and the Mishimoto intercooler were both set up and tested on a SuperFlow flow bench. The total pressure was measured at various flow rates to evaluate the restriction of each intercooler. The Mishimoto intercooler was found to have 32.4% less flow restriction than the stock intercooler.

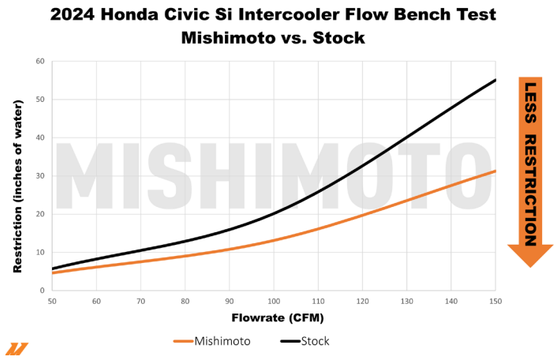

Figure 7: *Flow bench test results. The Mishimoto core is 32.4% less restrictive than the stock intercooler.*

Next, a 2024 Honda Civic Si was used to test each intercooler. The ambient temperature on the day of testing ranged from approximately 73.3°F (22.9°C) to approximately 77.2°F (25.1°C). To test the performance of the intercoolers, a Mustang dynamometer was used to conduct consistent ramp tests on the Civic Si.

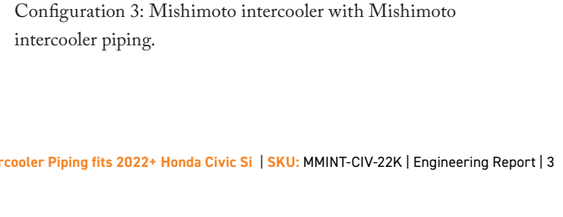

Figure 7: *The 2024 Honda Civic Si being set up on the Mustang dynamometer and prepared for testing.*

The Civic Si was brought to an operating temperature of 185°F (85°C) by idling it on the dyno. Once the vehicle was at operating temperature, multiple dyno runs were conducted until consistent figures were recorded. The vehicle was kept idling between runs to maintain a consistent engine coolant temperature for every run. As a final test for each test configuration, five dyno runs were made back-to-back to simulate heat-soak conditions. The three configurations we tested were:

Configuration 1: Stock intercooler with stock intercooler piping.

Configuration 2: Mishimoto intercooler with stock intercooler piping.

Configuration 3: Mishimoto intercooler with Mishimoto intercooler piping.

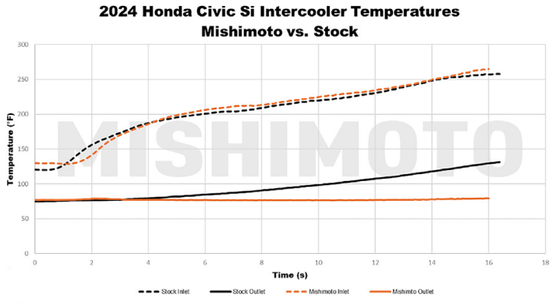

Figure 9: *Stock and Mishimoto intercooler temperatures.*

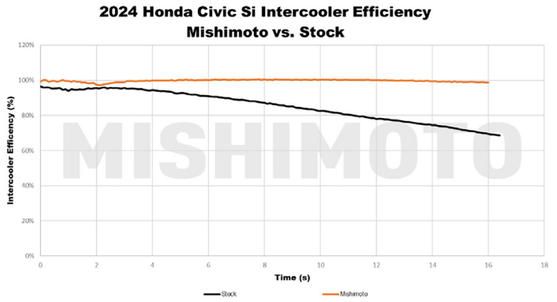

Figure 10: *Stock and Mishimoto intercooler efficiencies.*

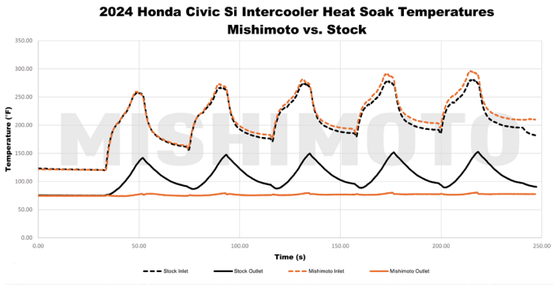

Figure 11: *Stock and Mishimoto intercooler temperatures during heat soak conditions.*

Intercooler inlet and outlet pressures were also monitored to ensure that the Mishimoto intercooler did not add a significant drop in boost pressure from inlet to outlet. An increase in boost pressure drop from inlet to outlet could cause strain on the turbo, as well as add additional heat into the engine cooling and intercooling system, which could result in a loss of horsepower. The Mishimoto intercooler had an average pressure drop of 0.88 psi compared to a 1.11 psi drop on the stock intercooler. This is a 20.7% reduction in pressure drop with the Mishimoto intercooler. Figure 12 below shows a linear trendline overlayed on the pressure differential across the stock and Mishimoto intercoolers during a dyno run.

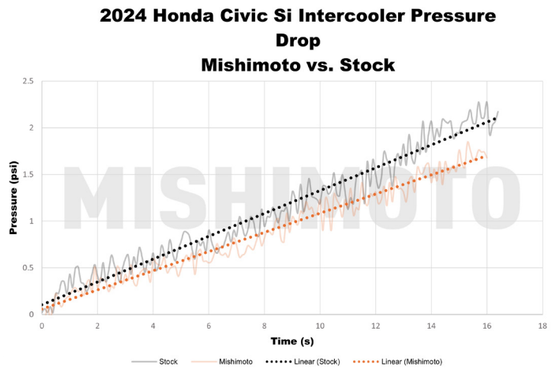

Figure 12: *Stock and Mishimoto intercooler pressure drop.*

Figure 13 below shows the dyno chart comparing the stock intercooler with the stock piping and the Mishimoto intercooler with the stock piping. Figure 14 compares the stock set up to the full Mishimoto intercooler plus Mishimoto piping kit.

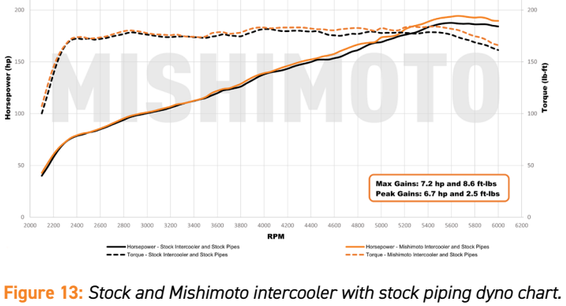

Figure 13: *Stock and Mishimoto intercooler with stock piping dyno chart.*

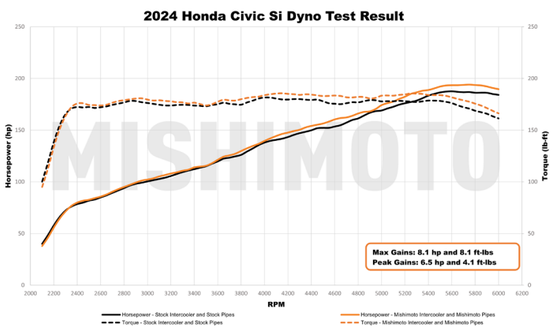

Figure 14: *Stock intercooler with stock piping and Mishimoto intercooler with Mishimoto piping dyno chart.*

Maintaining low charge-air temperatures is a crucial objective for achieving optimal performance from any engine. If the air temperature entering the engine begins to climb, the ECU will reduce power to preserve engine longevity. A performance intercooler will aid in preventing this loss of power. The Mishimoto intercooler reduced outlet temperatures while also decreasing the boost pressure drop, resulting in a gain in horsepower and torque.

Figure 15: *Mishimoto intercooler installed on the 2024 Honda Civic Si.*

TESTING DONE BY:

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